Sidewinder Mission Optimized Kinematic Enhancement (SMOKE)

ONR Program Code 35

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At a Glance

What is it?

- The Sidewinder Mission Optimized Kinematic Enhancement (SMOKE) FNC will increase the kinematic performance and lethality of an advanced short-range air-to-air missile, thus enabling extended range and decreased time to target.

How does it work?

- The SMOKE FNC will achieve this through a combination of propulsion technologies that include a 2-pulse end burning rocket motor, high efficiency warhead, and multi-function integrated energetic safety device.

What will it accomplish?

- By improving the kinematic performance of emerging air-to-air weapon systems over existing capabilities, SMOKE will ensure the U.S. warfighter maintains the tactical edge in air-to-air engagements against any peer competitor.

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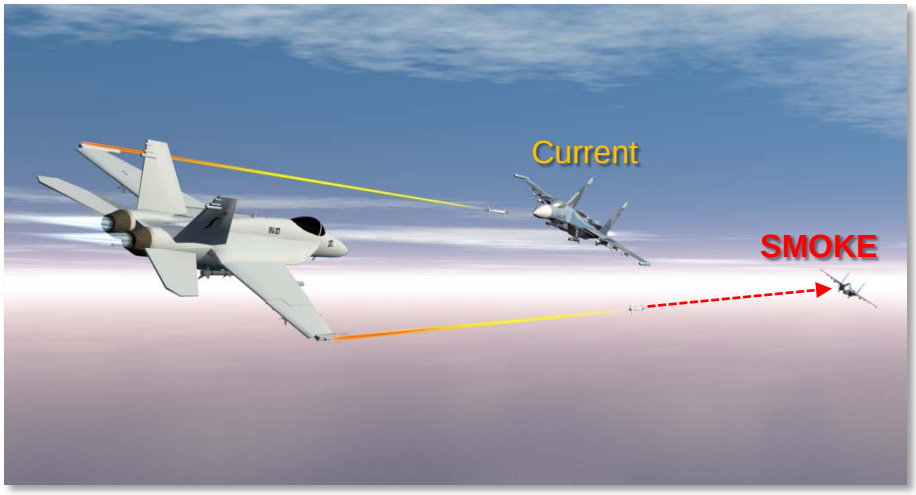

The Sidewinder Mission Optimized Kinematic Enhancement (SMOKE) Future Naval Capability (FNC) Product is developing missile propulsion, warhead and related subsystems for the improved kinematic performance and lethality of future advanced air-to-air missiles. To achieve this, the FNC is developing and integrating three advanced technologies: Two-Pulse End Burning Rocket Motor, High Efficiency Warhead, and Multi-function Integrated Energetic Safety Device (IESD). The kinematic and lethality performance enhancements are focused on improving the "no-escape range" and "time-to-target."

Many of the technologies being matured in this FNC are the fruits of ONR investment in a joint-service propulsion program known as Integrated High Payoff Rocket Propulsion Technology (IHPRPT). The propulsion effort will center on the development of a two-pulse end burning rocket motor to provide a significant increase in packaged total energy. Thrust output will be provided in two discrete pulses for optimization of kinematic performance throughout the expanded Weapons Engagement Zone. A high efficiency warhead will be developed to provide reduced volume with equal or greater lethality; the reduced warhead volume will allow for more rocket motor packaging volume. Lastly, initiation of both rocket motor pulses along with the warhead's safe-arm-device will be combined into a single mechanism – the multi-function IESD – again freeing up volume for the incorporation of additional propellant.

The SMOKE product is responding to higher kinematic performance and lethality requirements for advanced air-to-air weaponry as expressed by the Fleet and will provide the potential to achieve warfighter-defined tactical advantage for threats beyond 2020. This product will extend no-escape range, while also decreasing time of flight to target at a significant range for air-to-air engagements. Additional benefits derived from the two-pulse end burn design, new warhead and IESD will be improvement in Insensitive Munitions (IM) response.

Research Challenges and Opportunities:

- 2-pulse Highly Loaded Grain (HLG) concept configuration with 2-pulse survivable Thrust Vector Control (TVC)
- IM compliant, precision digital detonation warhead
- Distributed and command transmission fuze initiation methods